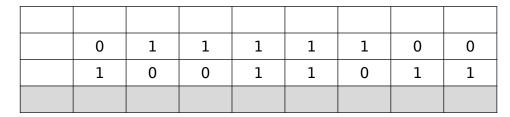## Homework 3 Binary arithmetic

1. Computers store data as bytes.

   a) How many bits make up a byte? [1]

   b) Add the following unsigned 8-bit binary integers: Show your working. [2]

	0	1	1	1	1	1	0	0
	1	0	0	1	1	0	1	1

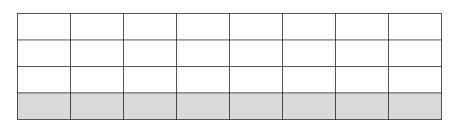   c) Explain the problem that has resulted from the calculation above using 8 bits. [1]

2. Calculate the largest integer value that can be stored in three combined unsigned binary bytes: Show your working. [2]

3. Show how the numbers 3 and -9 would be represented in one byte using sign and magnitude. [1]

   Why is this method of representing negative numbers not commonly used in computer processors? [2]

4. Two's complement can be used to perform subtraction. Calculate $124_{10} - 101_{10}$

using 8-bit two's complement binary (marks awarded for showing working out):

[4]

5. Using one byte to hold each number, with an imaginary binary point after the fourth digit, convert the following decimal numbers into binary: [3]

   a) (i)   4.75

      (ii) 3.1875

      (iii) 11.6875

   b) Convert the following binary numbers to decimal, assuming three bits after the binary point: [2]

      (i)   10001011

      (ii) 00101101

   c) What are the largest and smallest positive numbers that can be stored in one byte assuming three bits after the point?   [2]

[Total 20 marks]